Delivered by Innovate UK

Faraday Battery Challenge

Impact and Skills

September 2024

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What is the Faraday Battery Challenge?

The world is undergoing a transition to a low-carbon future, but transport remains the largest source of carbon dioxide emissions in the UK, accounting for 29% of emissions[1]. Developing low-cost, reliable and long-range electric vehicles is the key to reducing these emissions, with batteries playing a crucial role, not only in the automotive sector but in applications across aerospace, rail, marine, off-highway vehicles and static storage. The UK and the EU have established clear end dates for the sale of petrol and diesel vehicles, which is driving the demand for battery-powered electric vehicles. This transition to an electrified future will require many types of batteries, with some yet to be imagined. Therefore, the next generation of battery technology must be developed, along with exploration and de-risking of new production processes that ensure long-term UK success in battery manufacturing and car-making.

This is the reason the Faraday Battery Challenge exists. It is a £610 million investment from the UK government in battery technology. The mission-led programme coordinates and manages applied research, business-led innovation and national scale-up infrastructure in support of the UK's transition to electrification. Delivered by Innovate UK, on behalf of UK Research and Innovation (UKRI), the Faraday Battery Challenge supports the development of sustainable batteries that are cost- effective, high -performance, durable, safe and recyclable.

The Challenge has positioned the UK as a leading scientific, technological, and industrial player in the development of batteries. The significant investment has not only contributed to the growth of UK companies, but also signaled to investors that the UK is an attractive opportunity for innovation and production in the battery sector. This initiative has promoted innovation and collaboration among researchers, businesses, and other stakeholders, which has enhanced the UK's credibility in this sector. The support provided by the Faraday Battery Challenge extends far beyond the automotive industry and encompasses cross-sector activities in skills development, policy, regulations, and more.

The Challenge is designed to support innovation from early-stage, university-led research through to near-commercial scale facilities to test manufacturing, providing the UK with a world-beating innovation landscape to commercialise battery technology. It is focused on three pillars: research, business-led innovation and scale-up. The Challenge draws together these pillars to accelerate the delivery of a pipeline of activity, and has built a globally competitive scientific capability at scale, harnessing our best talent toward solving the challenges for battery technology.

This document highlights the UK's battery electric transition in action, with the cutting-edge projects of the Faraday Battery Challenge. These projects are blazing a trail towards a cleaner, more sustainable future, backed by groundbreaking research and innovative technology that are the driving force behind the UK's electrifying transition to a battery-powered future. As you will see through these projects, the UK is well -positioned to thrive in the emerging low-carbon economy, with robust infrastructure, a skilled workforce, and a strong innovation ecosystem in place to drive the transition to electrification.

Tony Harper, Faraday Battery Challenge Director

"The Faraday Battery Challenge is a pioneering 'lab to factory' programme focused on delivering the research, business-led innovation, infrastructure and people required for the UK to prosper from the unprecedented opportunities arising from the mass transition to electrification.

Just over six years into the programme, this brochure illustrates the breadth and depth of cutting-edge capability that has been built and reinforces why the UK is amongst the very best in the world in battery technology development."

1 *Transport and Environment Statistics 2021 Annual report.*

Faraday Battery Challenge

Research

The Faraday Institution is the UK's independent institute for electrochemical energy storage research, skills development, market analysis and early-stage commercialisation.

It brings together research scientists and industry partners on projects with commercial potential that will reduce battery cost, weight, and volume, improve performance and reliability, and develop whole-life strategies, including recycling and reuse.

Business-led Innovation

The Faraday Battery Challenge Innovation programme is supporting UK businesses to push the boundaries of battery innovation and grow the UK battery supply chain. £130m of funding from Innovate UK for UKRI has been invested for businesses to lead feasibility studies, and collaborative research and development projects across the battery value chain, in collaboration with the UK's world leading academics and research technology organisations.

Scale-up

The UK Battery Industrialisation Centre (UKBIC), the first facility of its kind in Europe, opened in 2021 and enables companies of all sizes to develop manufacturing capabilities for battery technologies to get them to market quickly.

Contact

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Impacts of Faraday Battery Challenge Programme by delivery partners

Impact of Innovate UK's Faraday Battery Challenge

£130m of Faraday Battery Challenge (FBC) grant funding through our collaboration research and development (CR&D) portfolio has unlocked:

Over
£800m
of further private investment into UK businesses

197
organisations across the UK

Support for
118
high-tech projects across the battery value chain, with >80% led by SMEs

38%
collaborations between SMEs and large businesses

Over
1,000
highly skilled jobs created and secured

80%
of projects include academic institutions

Opportunities for SMEs to connect and collaborate with international players in Australia, Japan, South Korea and the US

Further Programme Impact

£3.2m
of dedicated skills funding providing opportunities to re-skill, upskill and grow new skills in battery manufacturing and innovation across the UK

£2.6m
FBC funding through the Investor Partnership Programme has leveraged
£4.9m
of upfront private investment at point of grant

500
organisations connected through the Cross-Sector Battery Systems (CSBS) Innovation Network

£12m
investment for establishing the first open-access battery material scale-up facility in the UK

6 years of high-quality impacts in energy storage

The Faraday Institution has generated a great return on the UK's investment from a standing start in 2018

10

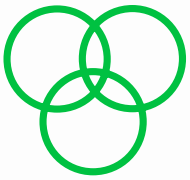
major research programmes, lead across 27 UK universities and research partners and 120+ industrial partners

777+

scientific papers published, 64.6% in top 10% journals, 47.5% in top 10% most cited, 44.1% with international collaborators

40

inventions identified, 18 patents filed and 7 published



500+

researchers united in a community, 45% new to field, to solve battery challenges through breakthrough science

14

entrepreneurial spin-outs, supported 17 industry fellows and 17 industry sprints

20

Faraday insights, 13 major reports, 12 national consultations, numerous briefings including House of Commons and House of Lord enquiries

85

PhDs receiving bespoke training for UK industrial and academic careers, and an additional 100+ affiliated with our projects

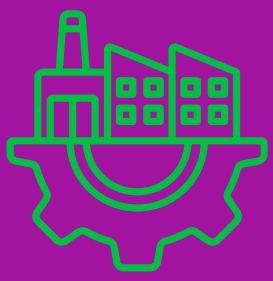
International collaboration

DSIT funded US UK joint battery research on recycling and cathole materials

6

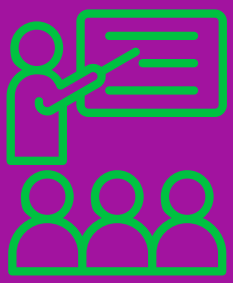
Royal Institution events hosted, attracting 300,000+ online viewers

UK Battery Industrialisation Centre



35

companies on more than 70 contracts to support the growth in cell scale-up, and module and pack development and manufacturing



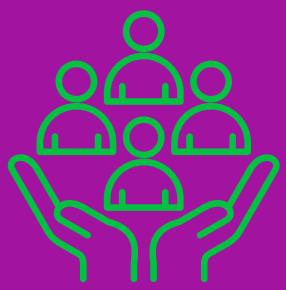
1,986

hours of external training delivered since 2023, across lineside bespoke training and publicly available bookable training courses

More than

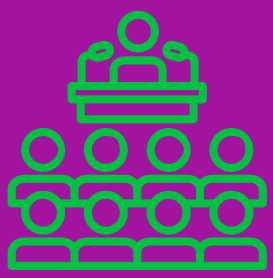
£2m

CR&D funding for 6 major projects



140

employees (as of June 2024), with many more moving back into the UK supply chain



An active conference and events programme at UKBIC, elsewhere in the UK, and overseas. Participated in Cenex Expo (previously, Low Carbon Vehicle conference), the Battery Cells & Systems Expo, The Battery Tech Expo (Silverstone), The Battery Tech Sweden, The Battery Show USA, The Battery Show (Stuttgart), JSAE, and other key events

Almost

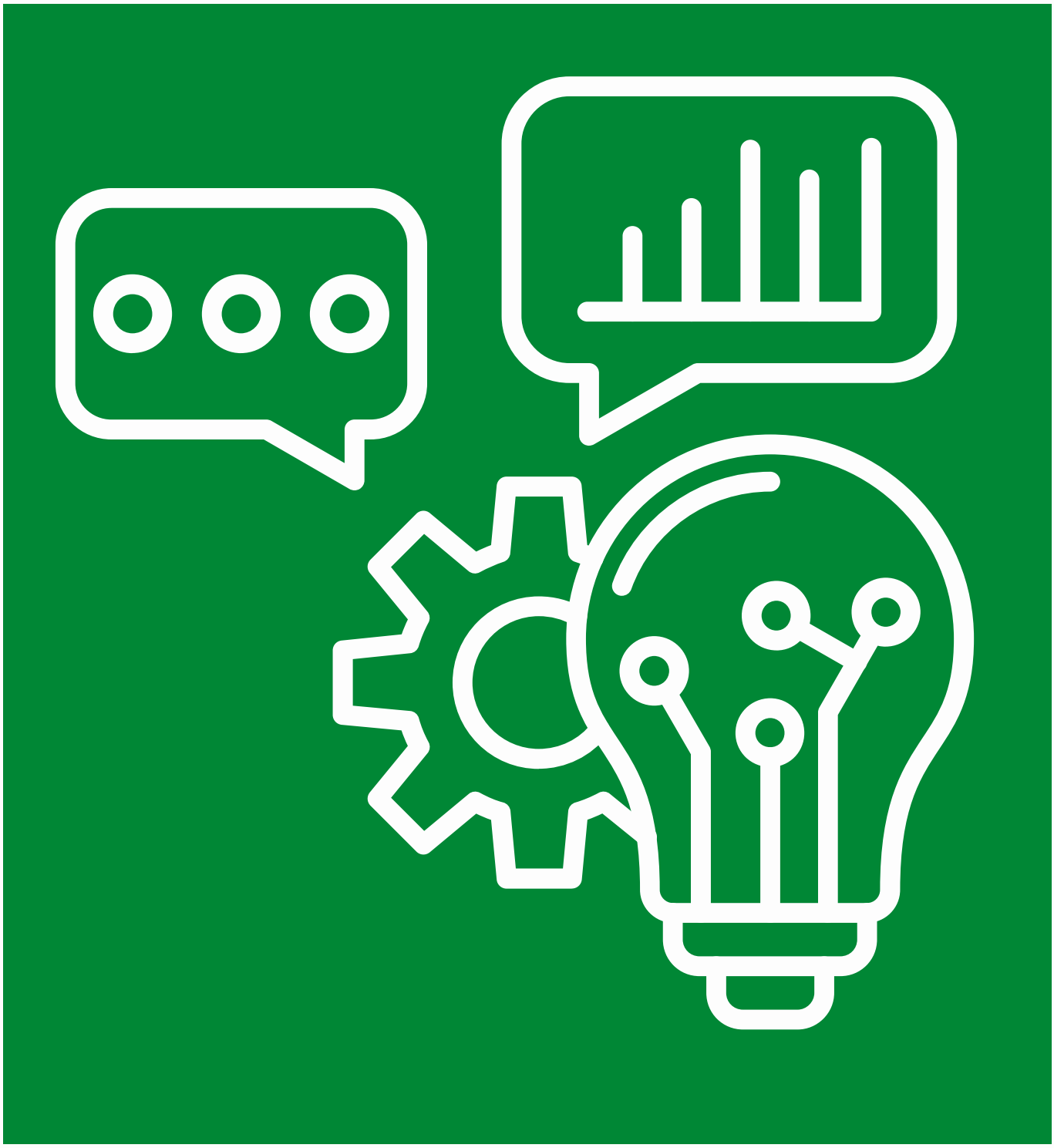
500

visits from a range of organisations, including 30 international delegations from the USA, Canada, Japan, Australia, Germany, Singapore, Sweden, China, Thailand, and others

Skills Programme

Unlocking skills opportunities today, for tomorrow's workforce.

It is no secret that the pace of change within the UK battery industry, coupled with the need for trained workers at all skills levels in the coming years, cannot be underestimated. Approximately 270,000 jobs will be needed across the UK battery and electric vehicle (EV) industry by 2040, and ensuring we inspire emerging talent, signpost career changers, and welcome job market returners into the exciting battery sector is vital. To aid skills development across the UK the Faraday Battery Challenge has commissioned a trio of projects to tackle known skills challenges, collaboratively aligning industry and skills providers across the UK through a skills framework, and unlocking training demand in regions linked to industry need.



Digital Enhanced Battery Ubiquitous Training – West Midlands (DEBUT-WM)

Building an inclusive and collaborative 'Battery Community'

Project costs
Total project costs: £1,200,000
Grant contribution: £1,200,000

Executive summary

The University College Birmingham will lead a regional partnership delivering an innovative project to re-skill, upskill and grow new skills in battery manufacturing and innovation.

The project aims to develop and deliver level 2 and 3 battery manufacturing training targeted at assembly, maintenance, logistics and production engineers, to be known as the Digital Enhanced Battery Ubiquitous Training – West Midlands (DEBUT-WM), to grow the region's battery manufacturing workforce. The training will be developed in collaboration with RAVMAC Ltd, Warwick Manufacturing Group and Cranfield University.

The programme will offer an ambitious blend of traditional physical training alongside advanced immersive digital technologies, such as augmented, virtual and mixed reality. Learners will be taught the skills used across battery manufacturing, repairing, recycling and reusing that will support them in employment in a variety of roles - ranging from production, maintenance, quality assurance, to engineering and technical support.

The trainee will have the freedom to explore a topic, practice and rehearse the relevant battery manufacturing skill on the path towards confidence and mastery of a new capability. The immersive training technology provides trainees with an immediate "hands-on" approach to rapidly acquiring new battery manufacturing skills in a realistic virtual environment where they are part of reinforcing the skills they have learned to offer to the modern workplace.

Project commitment

- Convene technologists/industry/education/training partners, and local government as a focal point for the shift to battery electric vehicle (EV) production.
- Collaboratively work with others to curate suitable existing education and training provision.
- Maximise regional engagement through, outreach and equality diversity and inclusion practices.
- Alignment with the Electrification Skills Network (ESN) to support delivery of skills fore-sighting and industrial demand.

Project supporters

Jaguar Land Rover
Delta Cosworth
West Midlands Combined Authority
Greater Birmingham & Solihull Institute of Technology
Microsoft
Zytek
and a growing network of support.

Contact:
Battery Project Team, University College Birmingham Email: batteryproject@ucb.ac.uk

Electrification Skills Network – Elevating electrification skills for a thriving UK future

The Electrification Skills Network project aims to establish itself as a comprehensive, and collaborative, electrification skills reference point to support the economic growth and success of the UK.

Project costs
Total project costs: £700,000
Grant contribution: £700,000

Executive summary

In summer 2023, Coventry University successfully bid for funding to deliver the National Electrification Skills Framework & Forum (which has subsequently been renamed Electrification Skills Network) from the Faraday Battery Challenge.

Leading a collaboration across a number of influential organisations, including UKBIC, Enginuity and WMG, Coventry University aims to deliver this one-of-a-kind project up to at least the end of March 2025. Throughout this period, the Electrification Skills Network will be committed to developing electrification skills and capabilities within the four nations of the UK, helping industry to address the evolving needs of a skilled workforce across diverse sectors within electrification.

The Electrification Skills Network will work to collaboratively align industry, skills providers and accreditation bodies by facilitating the creation of communities where ideas and challenges can be shared, and initiatives integrated to minimise duplication. This sharing of best practice will help accelerate skills solutions.

Serving as a comprehensive reference point for electrification skills, the Electrification Skills Network will provide the essential connections, guidance and best practices for industry while also contributing to a thriving electrification ecosystem.

The Electrification Skills Network's focus is to build a strong, resilient and agile workforce for today, alongside a pipeline of talent and capability, to support electrification skills provision for the future.

Timeline with milestones and deliverables

Up to March 2025, the Electrification Skills Network will be:

- Continuing to deliver a quarterly national Electrification Skills Forum to all stakeholders;
- Defining and establishing employer and stakeholder sector communities for electrification;
- Implementing a model and method, for supporting the connection of skills need to skills supply;
- Working a framework advisory group and establishing an electrification framework;
- Further establishing the electrification skills provider communities to support understanding and delivery;
- Investigating and proposing a model for future sustainability; and
- Supporting the creation of electrification learning content and solutions.

Project innovations

As part of the project, the Electrification Skills Network will be working with stakeholders across the electrification landscape to shape a clear and dynamic electrification framework for skills. The electrification framework will support the understanding of skills requirements and the availability of solutions across the UK.

The framework also aims to include a mechanism(s) for quality assurance to support industry by improving confidence and clarity in the skills solutions available.

Overall, the framework will help to bring clarity to skills requirements and support skill and capability development within the workforce, empowering industry and skills providers

Partners

ELECTRIFICATION SKILLS NETWORK
WMG THE UNIVERSITY OF WARWICK
Coventry University
Enginuity
UK BATTERY INDUSTRIALISATION CENTRE

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The National Battery Training and Skills Academy

The NBTSA is designed to support the UK's growing battery industries and eventually the whole ecosystem, delivering classroom and hands on training to existing and new staff as the industry undergoes a major expansion

Project costs
Total project costs: £1,300,000
Grant contribution: £1,300,000

Executive summary

In the North East of England there is a growing R&D and manufacturing base for lithium-ion batteries (LIBs). A key component of the national drive to greater electrification, batteries will be key to energy storage and transport of the future. The North East has the only Gigafactory and a thriving battery ecosystem which is undergoing rapid growth, leading to a predicted workforce gap.

The NBTSA is leading the response, designed to address the skills gap and ensure that operators and technicians have the skills required now and for the future, supporting the development of a workforce equipped with skills in the manufacture of innovative technologies.

A collaboration between Newcastle University and New College Durham, the academy focuses on level 2 and 3 training and skills. Learners are encouraged to continue their learning beyond the academy, and battery-related CPD courses and degree apprenticeships are available in-region, creating a continuum of skills development.

To attract the workforce of the future, the academy is also working with Newcastle's Discovery Museum. A two-year exhibition called Steam to Green explores the North East of England's journey from its key role in the industrial revolution, to leading today's drive to electrification.

Timeline with milestones and deliverables

To March 2025

Learning and qualifications through the academy covers a range of topics through different experiences, including:

- Industry aligned technical skills;
- Theory and principles with hands-on practical sessions; and
- Tools and equipment training using a scaled-down manufacturing line.

The programmes also draw on the thriving battery ecosystem of the North East of England and expertise of the partnership, including:

- The UK's only gigafactory alongside Nissan's electric vehicle (EV) assembly plant.
- Driving the Electric Revolution Industrialisation Centre North East.
- North East Battery Alliance.
- The Faraday Institution North East.
- World leading expertise in battery safety.

and more.

Project innovations

The project will provide a well-needed boost to the upskilling and reskilling of the existing and the new workforce required to support a growing industry. It will provide an understanding of the battery manufacturing environment and skills needed, while providing an insight into the opportunities that this industry can provide.

Hands-on experience will be delivered on a scaled-down manufacturing line, as well as classroom training, and the inclusion of immersive technologies to support learning, equip individuals with the skills and knowledge they need to be effective in their role, and supporting homegrown talent.

The project also aims to encourage individuals to continue their learning through CPD courses, and will create a pathway to further learning through degree apprenticeships with a focus on battery manufacture.

Partners

Newcastle University

New College Durham

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Delivered by Innovate UK

About Innovate UK

Innovate UK, part of UK Research and Innovation, is the UK's innovation agency. It works to create a better future by inspiring, involving and investing in businesses developing life-changing innovations. Its mission is to help companies to grow through their development and commercialisation of new products, processes and services, supported by an outstanding innovation ecosystem that is agile, inclusive and easy to navigate.

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September 2024

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